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Synthesis of 3-Selenylindoles through Organoselenium-Promoted Selenocyclization of 2-Vinylaniline

Zhiwei Zhao, Yetong Zhang, Yinlin Shao,* Wenzhang Xiong, Renhao Li,* and Jiuxi Chen*

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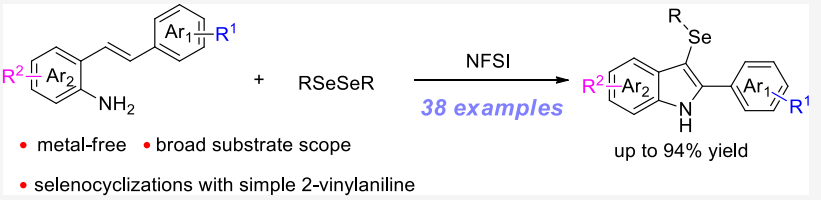

ABSTRACT: A novel metal-free one-pot protocol for the synthesis of potential biologically active molecules 3-selenylindoles via intramolecular cyclization/selenylation with simple 2-vinylaniline has been developed with moderate to good yield, thus representing it as a facile route to diverse substitution patterns around the indole core. The reaction proceeded smoothly with a broad substrate scope and excellent functional group tolerance. Moreover, the present synthetic route could be readily scaled up to gram quantity without difficulty. Mechanistic studies have revealed that in situ formed selenium electrophile species may be the key intermediate for the selenocyclization process.

INTRODUCTION

Organoselenium compounds are of considerable interest in pharmaceutical, biological, and material applications as well as in modern organic synthesis.[1] Organoselenium compounds could also be used as nonmetal catalysts to promote a series of useful transformations that present novel green synthetic methods compared with transition metals.[2] Several heterocyclic compounds containing the selenium motif exhibit excellent pharmacological activities.[3] The indole moiety is a very important class of heterocycles widely found in natural products, dyes, materials, and pharmaceutical ingredients.[4] Among the numerous indole derivatives, 3-selenylindoles are particularly attractive due to their various biological activities (Figure 1).[5] In view of their importance, the development of an efficient and general method for the synthesis of 3-selenylindoles is still highly desired.

In the past few decades, several strategies have been developed for the synthesis of 3-selenylindoles. Most have focused on the direct selenylation of pre-existing indoles with a series of suitable selenylation reagents such as diselenide, selenyl, sulfenyl halide, and selenium powder (Scheme 1a).[6] However, indoles, as starting materials, and transition metals, as catalysts, are required for the above methods. Therefore, other routes involving the cascade cyclization/selenylation reactions of various designed 2-amino-containing substrates have attracted more attention. The Sinha group disclosed an $NaBH_4$–I_2-catalyzed protocol for the construction of 3-selenylindoles with amino phenacylchlorides and diaryldiselenide (Scheme 1b).[7] Zhou, Larock, and Wang groups independently developed useful strategies for the synthesis of 3-selenylindoles via tandem cyclization of 2-alkynylaniline derivatives with selenylation reagent (Scheme 1c).[8] However, these approaches lack substrate generality and require harsh conditions, thus rendering them ineffective and impractical. Surprisingly, only scattered reports toward 2-vinylanilines have been applied for the construction of 3-selenylindoles over the past century, probably due to the lower unsaturation and weaker activity compared with 2-alkynylaniline derivatives. The Wang group reported that a tandem reaction of 2-(gem-dibromovinyl)-*N*-methylsulfonylanilines with diselenides in the presence of *t*-BuOLi/I_2 generated the corresponding 3-selenylindoles (Scheme 1d).[9] As a consequence, the development of a mild and useful platform, affording diverse and

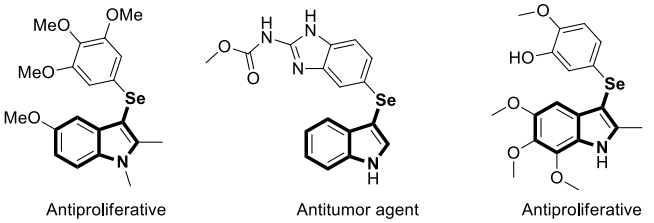

Figure 1. Bioactive molecules of 3-selenylindoles.

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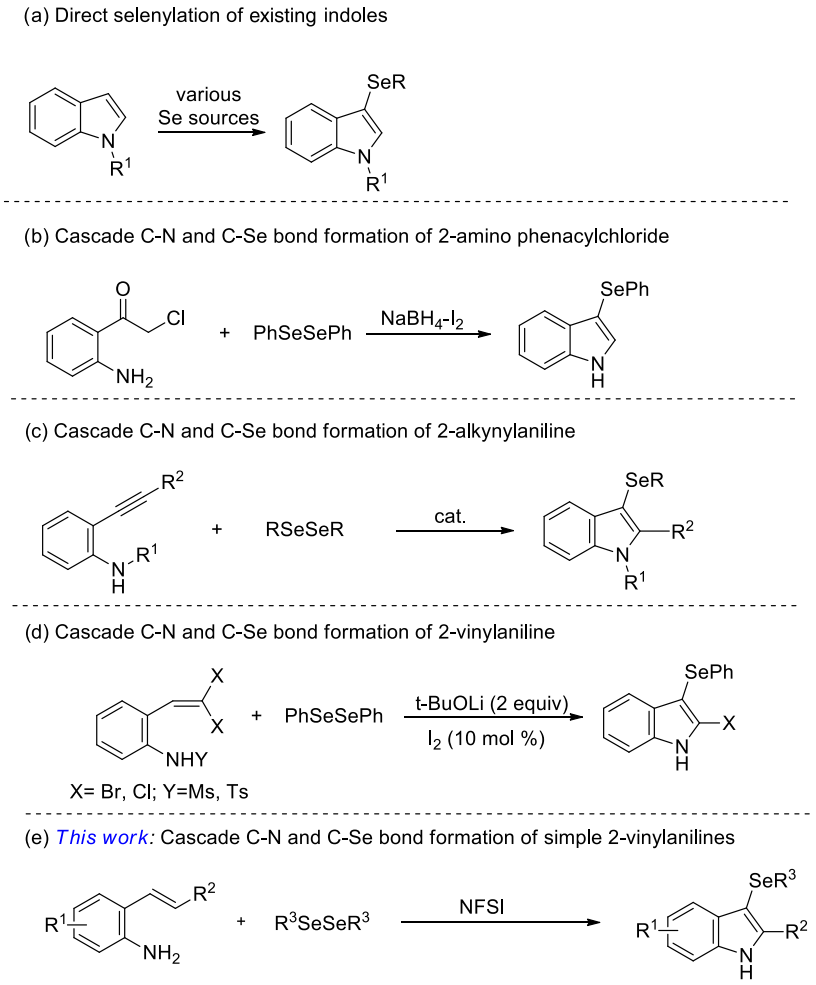
Scheme 1. 3-Selenylindole Synthesis Strategies



versatile 3-selenylindoles with simple 2-vinylaniline derivatives as substrates, is still a demanding goal. Herein, we report the first example of a metal-free method for the synthesis of 3-selenylindoles through intramolecular oxidative C−H amination of 2-vinylaniline followed by selenylation with easily achieved simple 2-vinylanilines (Scheme 1e).

RESULTS AND DISCUSSION

At the outset of our study, the investigation employing (*E*)-2-styrylaniline (**1a**) and diphenyldiselenide (**2a**) as model substrates was chosen to explore the optimal conditions. Delightfully, treatment of **1a** with 1 equiv of **2a** and 2.0 equiv of *N*-fluorobenzenesulfonimide (NFSI) in tetrahydrofuran (THF) at 90 °C under air led to the anticipated **3a** in 30% isolated yield (Table 1, entry 1). Based on this encouraging result, we next tested different solvents. The result showed that pyridine was the best solvent, increasing the yield to 56%, probably due to the better elimination of released acid in transformation. However, other organic bases such as Et_3N and piperidine inhibited the reaction (Table 1, entries 2−13). Then, other oxidants such as 3-chloroperbenzoic acid (*m*-CPBA), $FeCl_3$, and $Cu(OAc)_2$ were tested, and NFSI showed the best efficiency (Table 1, entries 14−16).[10] In these transformations, no arylindole byproducts were detected. Attempts to further enhance the efficiency of the product formed by elevating the reaction temperature to 110 °C and shortening the reaction time to 4 h were successful, affording **3a** in 87% yield (Table 1, entries 17−19). The yield of **3a** decreased to some extent either by increasing the amount of NFSI to 2.5 equiv or by decreasing it to 1.5 equiv (Table 1, entries 20 and 21). Therefore, the optimal reaction conditions can be summarized as follows: 0.2 mmol 2-vinylaniline and 0.2 mmol PhSeSePh in pyridine (2.0 mL) with 0.4 mmol NFSI at 110 °C for 4 h under an air atmosphere.

Using the established optimal reaction conditions, we sought to probe the scope of the substrate and generality of this transformation (Table 2). A variety of substituents (R^1, R^2) in compound **1** were tested and delivered to product **3** in uniformly high efficiency. First, the variation of the R^1 group was investigated. The steric effect of the R^1 substituent had an expected impact on the reaction. For example, the substrates bearing an *o*-, *m*-, or *p*-methyl substituent attached to the Ar_1 ring were evaluated, providing **3b**−**3d** in 69−90% yield, respectively. The lower yield of **3b** may arise from the steric hindrance of the methyl group. The electronic effect of the substituents affected the yields of this transformation to some extent. In general, the substrates bearing an electron-donating substituent provided a slightly higher yield than those bearing an electron-withdrawing substituent. For example, when the substrates bearing a *para*-tertiary butyl and methoxy group at the Ar_1 ring were examined, **3e** and **3f** were obtained in 92 and 94% yield, respectively. Electron-withdrawing groups, such as chloro (**3g**−**3i**), fluoro (**3j**, **3k**), trifluoromethyl (**3l**), and nitro (**3m**), at the Ar_1 ring were well-tolerated in this transformation

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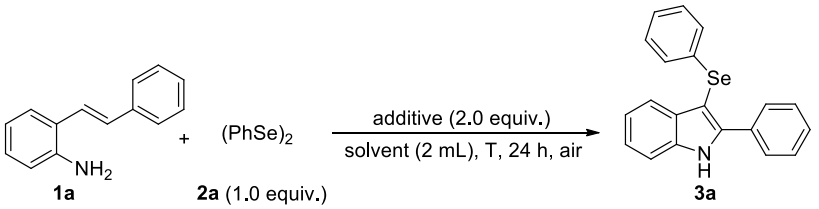
J. Org. Chem. XXXX, XXX, XXX−XXX

Table 1. Optimization of the Reaction Conditions[a]



entry	solvent	additive	yield (%)[b]
1	THF	NFSI	30
2	toluene	NFSI	ND[c]
3	1,4-dioxane	NFSI	trace
4	$ClCH_2CH_2Cl$	NFSI	ND
5	CH_3CN	NFSI	trace
6	*N*-methyl-2-pyrrolidone (NMP)	NFSI	19
7	dimethylformamide (DMF)	NFSI	trace
8	dimethylacetamide (DMA)	NFSI	22
9	dimethyl sulfoxide (DMSO)	NFSI	trace
10	CH_3OH	NFSI	trace
11	pyridine	NFSI	56
12	piperidine	NFSI	ND
13	Net_3	NFSI	ND
14	pyridine	*m*-CPBA	trace
15	pyridine	$FeCl_3$	ND
16	pyridine	$Cu(OAc)_2$	ND
17[d]	pyridine	NFSI	55
18[e]	pyridine	NFSI	71
19[e,f]	pyridine	NFSI	87
20[e]	pyridine	NFSI[g]	51
21[e]	pyridine	NFSI[h]	70

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.2 mmol), additive (0.4 mmol), solvent (2.0 mL), sealed tube, air, 90 °C, 24 h. [b]Isolated yields. [c]ND = not detected. [d]At 70 °C. [e]At 110 °C. [f]4 h. [g]*N*-fluorobenzenesulfonimide (NFSI) (0.3 mmol). [h]NFSI (0.5 mmol).

affording the desired 3-selenylindoles in a lower yield, ranging from 60−87%. Naphthyl was also well-tolerated, affording the desired product **3n** in 89% yield. However, alkyl groups such as benzyl at the vinyl could not go through such transformation (**3o**). We then examined the substitution effect of R^2 on the Ar_2 ring of (*E*)-2(arylvinyl)anilines. In general, substrates bearing an electron-withdrawing substituent at the Ar_2 ring produced a slightly higher yield of selenocyclization products than those analogues bearing an electron-donating substituent (**3p−3y**). The pyridinyl containing substrate **1z** was incompatible with the current transformation. However, (*E*)-4-methyl-*N*-(2-styrylphenyl)benzenesulfonamide (**1za**) and (*E*)-2-styrylphenol (**1zb**) failed to afford the desired products.

Subsequently, the scope of diselenides **2** was also investigated using the reactions with **1a** under the optimized reaction conditions (Table 3). Both the steric effect and the electronic effect of the substituent attached to the aryl group had an obvious impact on the reaction. Electron-withdrawing groups such as $-NO_2$ and −F containing diaryl diselenides furnished products **3zg** and **3zh** in relatively higher yields of 92 and 88% compared with electron-donating groups containing diaryl diselenides (**3zc−3zf**). Notably, the synthesis of di(naphthalen-1-yl)diselane and di(thiophen-2-yl)diselane also proceeded smoothly (**3zi** and **3zj**). Apart from arylseleno derivatives, methylseleno derivatives as metabolites of Se in humans are also extremely important.[11] The scope of 2-vinylanilines with dimethyl diselenides was also investigated, affording the desired products in moderate to good yields (**3zk−3zo**).

The present synthetic route to 3-selenylindoles derivatives could be readily scaled up to the gram quantity without difficulty. For instance, the reaction at the 6 mmol scale afforded the corresponding product **3a** in 85% isolated yield, similar to that obtained on a smaller scale (Scheme 2).

To gain insight into the reaction mechanism, further control experiments were performed (Scheme 3). Our initial attempts to perform the reaction in the absence of NFSI failed to give the desired product **3a** (Scheme 3a). Next, the amount of diselenides used was carefully studied. For example, the reaction conditions using diselenides (0.5 and 0.6 equiv) were tested, affording the desired product **3a** in 59 and 76% yield, respectively (Scheme 3b). These results indicated that diselenides may decompose into two equal selenium parts such that both of them take part in the cyclization procress. Moreover, PhSeF and $PhSeN(SO_2Ph)_2$ were detected by gas chromatography−mass spectrometry (GC−MS) analysis in situ the reaction medium.

A possible reaction mechanism is depicted in Scheme 4.[12] First, NFSI undergoes nucleophilic attack by diphenyl diselane, leading to cationic species **I**. These selenium electrophiles subsequently attack the C=C double bond of **1a**, giving rise to seleniranium ion **II**. Then, intramolecular attack of the amino group leads to three-membered ring opening to yield intermediate **III**. Participation of pyridine assists proton elimination and removal of the selenium electrophile PhSeX to give **3a**.

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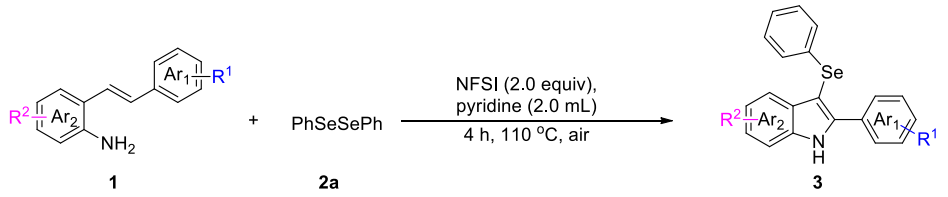
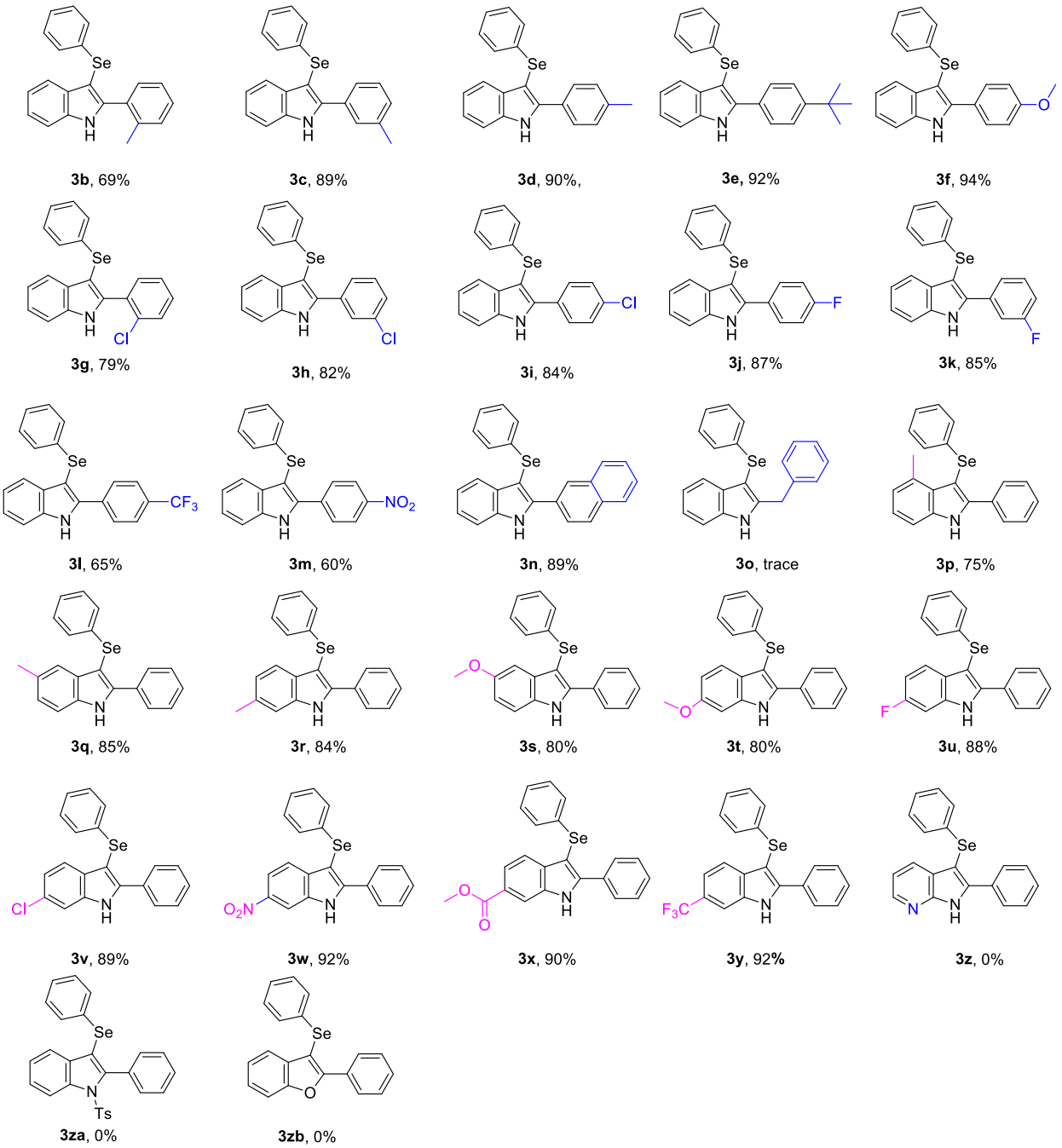
J. Org. Chem. XXXX, XXX, XXX−XXX

Table 2. Scope of 2-Vinylaniline Derivatives with 1,2-Diphenyl diselane[a]





[a]Reaction conditions: **1** (0.2 mmol), **2a** (0.2 mmol), NFSI (0.4 mmol), pyridine (2.0 mL), sealed tube, air, 110 °C, 4 h, isolated yields.

CONCLUSIONS

In summary, a metal-free protocol for the synthesis of potential biologically active molecules 3-selenylindoles via intramolecular cyclization/selenylation with simple 2-vinylaniline has been developed. The reaction proceeded smoothly with a broad substrate scope and excellent functional group tolerance, representing it as a facile route to diverse substitution patterns around the indole core. Moreover, the present synthetic route could be readily scaled up to gram quantity. Mechanistic

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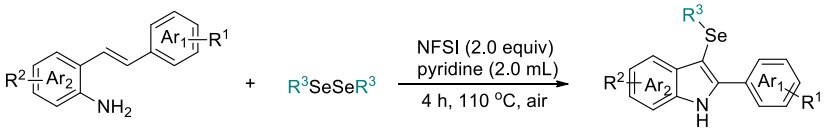
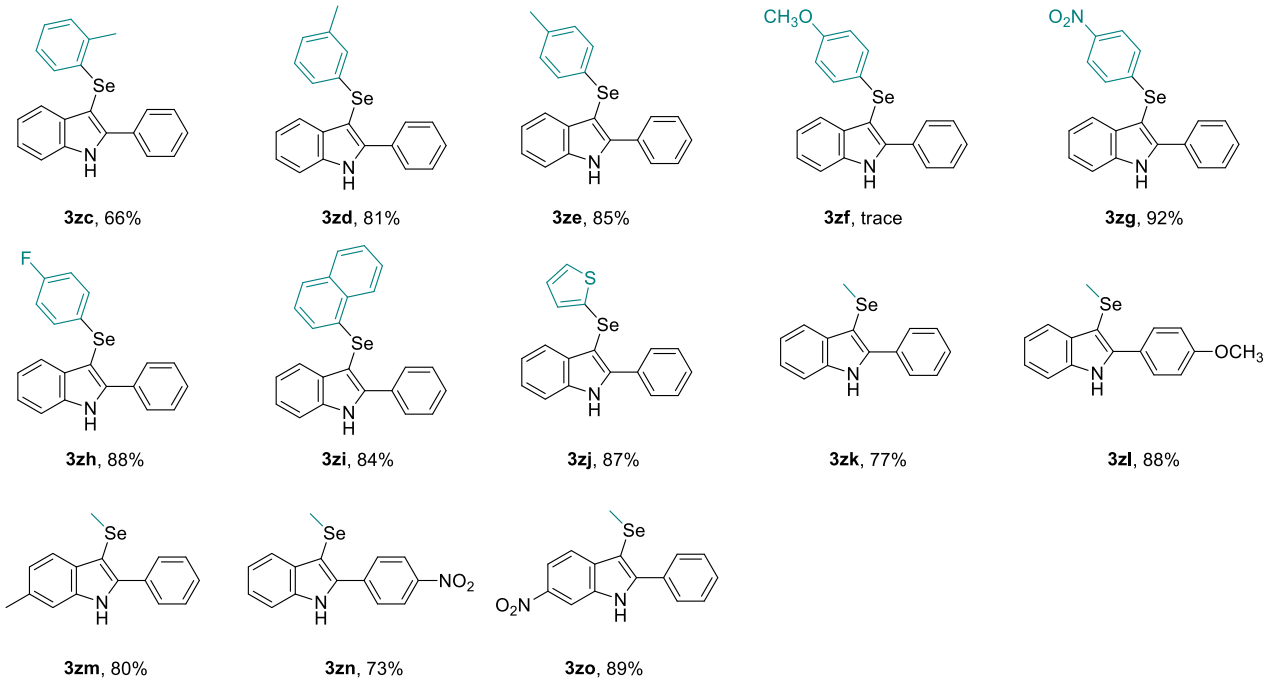
Table 3. Scope of Diselenides[a]

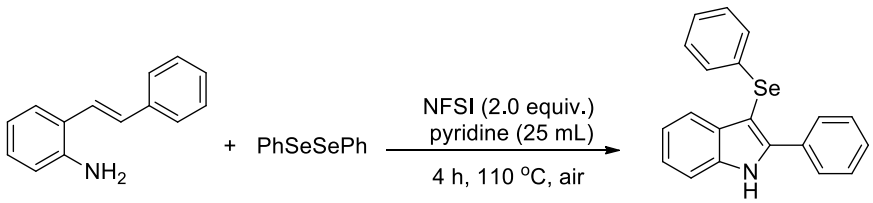


1 2 3



[a]Reaction conditions: **1** (0.2 mmol), **2** (0.2 mmol), NFSI (0.4 mmol), pyridine (2.0 mL), sealed tube, air, 110 °C, 4 h, isolated yields.

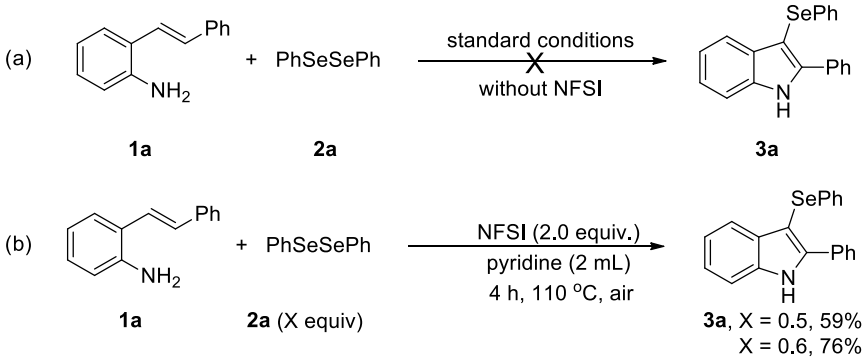
Scheme 2. Gram-Scale Synthesis of 3a



1a **2a** **3a**

6 mmol, 1.17 g 85%, 1.78 g

Scheme 3. Control Experiments



1a **2a** **3a**

1a **2a** (X equiv) **3a**, X = 0.5, 59% yield
X = 0.6, 76% yield

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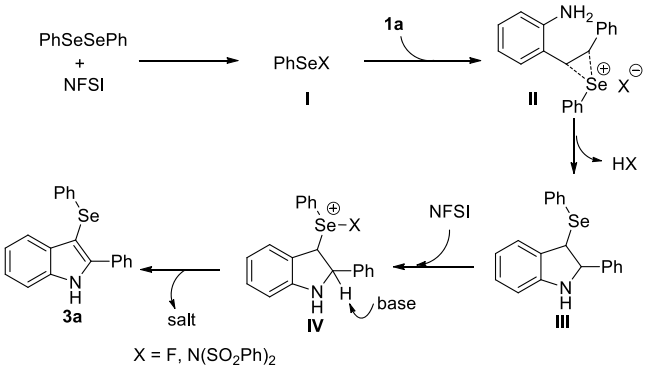
J. Org. Chem. XXXX, XXX, XXX−XXX

Scheme 4. Proposed Mechanism



studies have revealed that in situ formed selenium electrophile species may be the key intermediate for the selenocyclization process.

EXPERIMENTAL SECTION

General Methods. Melting points are uncorrected and recorded on WRS-1B Digital Melting Point Apparatus. All 2-vinylaniline substrates were synthesized according to the corresponding literature.[13] ^{1}H nuclear magnetic resonance (NMR) and ^{13}C NMR spectra were measured on a 500 MHz Bruker spectrometer, using $CDCl_3$ as the solvent with tetramethylsilane (TMS) as the internal standard at room temperature. Chemical shifts are given in δ relative to TMS, and the coupling constants J are given in Hz. High-resolution mass spectrometry (HRMS) was performed using a time-of-flight mass spectrometry (TOF MS) instrument with an electron ionization (EI) or electrospray ionization (ESI) source. Column chromatography was performed using EM silica gel 60 (300−400 mesh).

General Procedure for the Synthesis of 3-Selenylindoles. Different diselenides (0.2 mmol, 1.0 equiv), *N*-fluorobenzenesulfonimide (NFSI) (2.0 equiv), (*E*)-2-styrylaniline with different substituent groups (1.0 equiv), and pyridine (2 mL) were successively added to the schlenk reaction tube and allowed to react. The reaction mixture was stirred gently in an oil bath at 110 °C for 4 h. The reaction mixture was then cooled to room temperature, washed with saturated $NaHCO_3$ (10 mL), and extracted with ethyl acetate (3 × 8 mL). The combined organic layers were dried over anhydrous Na_2SO_4 and evaporated under vacuum. The residue was purified by flash column chromatography with hexane/ethyl acetate to afford the desired product.

(E)-2-styrylaniline (***1a***). Light yellow solid (1.853 g, 95%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (d, J = 8.0 Hz, 2H), 7.43 (d, J = 7.5 Hz, 1H), 7.39−7.36 (m, 2H), 7.30−7.26 (m, 1H), 7.19 (d, J = 16.5 Hz, 1H), 7.14−7.11 (m, 1H), 7.01 (d, J = 16.0 Hz, 1H), 6.86−6.83 (m, 1H), 6.75 (d, J = 8.0 Hz, 1H), 3.91 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.8, 137.6, 130.4, 128.7, 128.6, 127.5, 127.2, 126.4, 124.3, 124.0, 119.3, 116.3. Spectroscopic data for the title compound were consistent with those reported in the literature.[14]

(E)-2-(2-methylstyryl)aniline (***1b***). Light yellow solid (1.672 g, 80%), (hexane/ethyl acetate = 12:1), mp 91−92 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, J = 6.8 Hz, 1H), 7.44 (d, J = 7.6 Hz, 1H), 7.25−7.21 (m, 4H), 7.17−7.13 (m, 1H), 7.07 (d, J = 15.6 Hz, 1H), 6.87−6.84 (m, 1H), 6.75 (d, J = 7.6 Hz, 1H), 3.61 (s, 2H), 2.44 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.7, 136.7, 135.7, 130.4, 128.6, 128.4, 127.5, 127.4, 126.2, 125.6, 125.4, 124.4, 119.3, 116.3, 19.9. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{15}H_{16}N$: 210.1277; Found 210.1270.

(E)-2-(3-methylstyryl)aniline (***1c***). Khaki solid (1.777 g, 85%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43 (d, J = 7.5 Hz, 1H), 7.37−7.34 (m, 2H), 7.30−7.27, (m, 1H), 7.18 (d, J = 16.0 Hz, 1H), 7.15−7.11 (m, 2H), 7.00 (d, J = 16.5 Hz, 1H), 6.86−6.83 (m, 1H), 6.75−6.73 (m, 1H), 3.85 (s, 2H), 2.41 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.9, 138.2, 137.5, 130.4, 128.6, 128.4, 127.2, 127.1, 124.0, 123.9, 123.6, 119.1, 116.2, 21.4. Spectroscopic data for the title compound were consistent with those reported in the literature.[14b]

(E)-2-(4-methylstyryl)aniline (***1d***). Light yellow solid (1.944 g, 93%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47−7.44 (m, 3H), 7.22 (d, J = 8.0 Hz, 2H), 7.18−7.12 (m, 2H), 7.01 (d, J = 16.0 Hz, 1H), 6.88−6.84 (m, 1H), 6.76−6.74 (m, 1H), 3.75 (s, 2H), 2.41 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.7, 137.4, 134.8, 130.2, 129.3, 128.4, 127.1, 126.3, 124.0, 123.2, 119.1, 116.2, 21.2. Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

(E)-2-(4-tert-butyl)styryl)aniline (***1e***). Milk white solid (2.260 g, 90%), (hexane/ethyl acetate = 12:1), mp 116−117 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.48 (d, J = 8.5 Hz, 2H), 7.43−7.40 (m, 3H), 7.17−7.10 (m, 2H), 7.00 (d, J = 16.0 Hz, 1H), 6.85−6.82 (m, 1H), 6.75−6.74 (m, 1H), 3.96 (s, 2H), 1.36 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 150.8, 143.6, 134.8, 130.3, 128.5, 127.2, 126.2, 125.6, 124.2, 123.5, 119.3, 116.3, 34.6, 31.3. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{18}H_{22}N$ 252.1747; Found 252.1744.

(E)-2-(4-methoxystyryl)aniline (***1f***). Khaki solid (1.755 g, 78%), (hexane/ethyl acetate = 8:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.46 (d, J = 8.5 Hz, 2H), 7.41 (d, J = 7.5 Hz, 1H), 7.13−7.09 (m, 1H), 7.05 (d, J = 16.0 Hz, 1H), 6.96 (d, J = 16.0 Hz, 1H), 6.92 (d, J = 9.0 Hz, 2H), 6.84−6.81 (m, 1H), 6.74−6.72 (m, 1H), 3.84 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 159.3, 143.7, 130.4, 129.9, 128.3, 127.6, 127.0, 124.2, 122.1, 119.2, 116.2, 114.1, 55.3. Spectroscopic data for the title compound were consistent with those reported in the literature.[2d]

(E)-2-(2-chlorostyryl)aniline (***1g***). Khaki solid (1.809 g, 79%), (hexane/ethyl acetate = 12:1), mp 78−79 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72−7.70 (m, 1H), 7.50−7.41 (m, 3H), 7.31−7.28 (m, 1H), 7.25−7.20 (m, 1H), 7.19−7.15 (m, 2H), 6.89−6.85 (m, 1H), 6.75 (d, J = 8.0 Hz, 1H), 3.81 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 144.0, 135.7, 133.3, 129.7, 129.0, 128.4, 127.6, 127.0, 126.9, 126.5, 126.2, 123.5, 119.2, 116.4. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{14}H_{13}ClN$ 230.0731; Found 230.0725.

(E)-2-(3-chlorostyryl)aniline (***1h***). Light yellow solid (1.924 g, 84%), (hexane/ethyl acetate = 12:1), mp 92−93 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.52 (s, 1H), 7.42 (d, J = 8.0 Hz, 1H), 7.37 (d, J = 7.5 Hz, 1H), 7.31−7.28 (m, 1H), 7.25 (d, J = 7.0 Hz, 1H), 7.20−7.14 (m 2H), 6.94 (d, J = 16.0 Hz, 1H), 6.86−6.83 (m, 1H), 6.74 (d, J = 8.0 Hz, 1H), 3.80 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 144.1, 139.5, 134.6, 129.8, 129.0, 128.6, 127.3, 127.2, 126.1, 125.6, 124.6, 123.2, 119.2, 116.4. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{14}H_{13}ClN$ 230.0731; Found 230.0732.

(E)-2-(4-chlorostyryl)aniline (***1i***). Light yellow solid (2.084 g, 91%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45−7.39 (m, 3H), 7.33 (d, J = 8.4 Hz, 2H), 7.17−7.11 (m, 2H), 6.94 (d, J = 16.0 Hz, 1H), 6.85−6.81 (m, 1H), 6.74 (d, J = 8.0 Hz, 1H), 3.78 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.8, 136.1, 133.1, 128.9, 128.9, 128.8, 127.5, 127.2, 124.9, 123.6, 119.3, 116.4. Spectroscopic data for the title compound were consistent with those reported in the literature.[14b]

(E)-2-(4-fluorostyryl)aniline (***1j***). Khaki solid (1.854 g, 87%), (hexane/ethyl acetate = 10:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.49−7.46 (m, 2H), 7.40 (d, J = 7.5 Hz, 1H), 7.14−7.04 (m, 4H), 6.96 (d, J = 16.0 Hz, 1H), 6.85−6.82 (m, 1H), 6.74 (d, J = 8.0 Hz, 1H), 3.93 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 162.3 (d, J_{C-F} = 246.3 Hz), 143.7, 133.8 (d, J_{C-F} = 2.5 Hz), 129.1, 128.7, 127.9 (d, J_{C-F} = 7.5 Hz), 127.2, 124.1 (d, J_{C-F} = 2.5 Hz), 123.9, 119.4, 116.4, 115.6 (d, J_{C-F} = 21.3 Hz). Spectroscopic data for the title compound were consistent with those reported in the literature.[14b]

(E)-2-(3-fluorostyryl)aniline (***1k***). Yellow solid (1.768 g, 83%), (hexane/ethyl acetate = 10:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41 (d, J = 7.6 Hz, 1H), 7.34−7.27 (m, 2H), 7.23−7.17 (m, 2H), 7.15−7.11 (m, 1H), 6.98−6.94 (m, 2H), 6.86−6.82 (m, 1H), 6.76 (d, J = 8.0 Hz, 1H), 4.04 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 163.2 (d, J_{C-F} = 243.8 Hz), 143.7, 140.0 (d, J_{C-F} = 7.5 Hz), 130.1 (d, J_{C-F} = 8.8 Hz), 129.1 (d, J_{C-F} = 3.8 Hz), 129.0, 127.3, 125.6, 123.5,

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J. Org. Chem. XXXX, XXX, XXX−XXX

122.4 (d, J_{C-F} = 2.5 Hz), 119.4, 116.6, 114.3 (d, J_{C-F} = 21.3 Hz), 112.7 (d, J_{C-F} = 21.3 Hz). Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-2-(4-(trifluoromethyl)styryl)aniline (**1l**).* Light yellow solid (2.183 g, 83%), (hexane/ethyl acetate = 8:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62−7.58 (m, 4H), 7.43 (d, J = 7.5 Hz, 1H), 7.29−7.27 (m, 1H), 7.17−7.14 (m, 1H), 7.02 (d, J = 16.0 Hz, 1H), 6.86−6.83 (m, 1H), 6.75 (d, J = 8.0 Hz, 1H), 3.96 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ144.0, 141.1, 129.3, 129.2 (d, J_{C-F} = 32.5 Hz), 128.6, 127.3, 126.8, 126.5, 125.6 (q, J_{C-F} = 3.8 Hz), 124.2 (d, J_{C-F} = 270.0 Hz), 123.3, 119.4, 116.6. Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-2-(4-nitrostyryl)aniline (**1m**).* Red solid (2.064 g, 86%), (hexane/ethyl acetate = 8:1), mp 132−133 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.21 (d, J = 8.5 Hz, 2H), 7.62 (d, J = 8.5 Hz, 2H), 7.43 (d, J = 7.5 Hz, 1H), 7.35 (d, J = 16.0 Hz, 1H), 7.18−7.15 (m, 1H), 7.04 (d, J = 16.0 Hz, 1H), 6.85−6.82 (m, 1H), 6.75 (d, J = 8.0 Hz, 1H), 3.92 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 146.7, 144.4, 144.2, 129.8, 128.9, 127.5, 127.4, 126.7, 124.1, 122.7, 119.4, 116.7. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{14}H_{13}N_2O_2$ 241.0972; Found 241.0968.

*(E)-2-(2-naphthalen-2-yl)vinyl)aniline (**1n**).* Light yellow solid (2.059 g, 84%), (hexane/ethyl acetate = 12:1), mp 126−127 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86−7.83 (m, 4H), 7.77−7.75 (m, 1H), 7.51−7.45 (m, 3H), 7.32 (d, J = 16.0 Hz, 1H), 7.19−7.13 (m, 2H), 6.88−6.85 (s, 1H), 6.77(d, J = 8.0 Hz, 1H), 4.02 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.7, 135.1, 133.7, 133.0, 130.4, 128.7, 128.3, 128.0, 127.7, 127.2, 126.4, 126.3, 125.9, 124.5, 124.0, 123.5, 119.4, 116.5. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{18}H_{16}N$ 246.1277; Found 246.1278.

*(E)-3-methyl-2-styrylaniline (**1p**).* Orange oil (1.568 g, 75%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 7.2 Hz, 2H), 7.46−7.42 (m, 2H), 7.37−7.33 (m, 1H), 7.13−7.04 (m, 2H), 6.92 (d, J = 16.8 Hz, 1H), 6.73 (d, J = 7.6 Hz, 1H), 6.67 (d, J = 8.0 Hz, 1H), 3.91 (s, 2H), 2.38 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 144.1, 137.3, 137.3, 133.9, 128.6, 127.7, 127.6, 126.2, 124.7, 123.1, 120.5, 113.4, 20.7. Spectroscopic data for the title compound were consistent with those reported in the literature.[14c]

*(E)-4-methyl-2-styrylaniline (**1q**).* Khaki solid (1.756 g, 84%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.50 (d, J = 7.5 Hz, 2H), 7.36−7.33 (m, 2H), 7.25−7.22 (m, 2H), 7.15 (d, J = 16.0 Hz, 1H), 6.97 (d, J = 16.0 Hz, 1H), 6.91 (d, J = 8.0 Hz, 1H), 6.63 (d, J = 8.0 Hz, 1H), 3.74 (s, 2H), 2.28 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 141.4, 137.7, 130.0, 129.3, 128.6, 128.4, 127.5, 127.5, 126.4, 124.3, 123.9, 116.5, 20.5. Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-5-methyl-2-styrylaniline (**1r**).* Milk white solid (1.819 g, 87%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.48 (d, J = 7.5 Hz, 2H), 7.34−7.28 (m, 3H), 7.24−7.21 (m, 1H), 7.12 (d, J = 16.0 Hz, 1H), 6.93 (d, J = 16.0 Hz, 1H), 6.62 (d, J = 7.5 Hz, 1H), 6.52 (s, 1H), 3.77 (s, 2H), 2.26 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.7, 138.7, 137.8, 129.3, 128.6, 127.3, 127.1, 126.3, 124.2, 121.2, 120.2, 117.0, 21.2. Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-4-methoxy-2-styrylaniline (**1s**).* Yellow oil (1.710 g, 76%), (hexane/ethyl acetate = 8:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 (d, J = 7.5 Hz, 2H), 7.40−7.37 (m, 2H), 7.30−7.27 (m, 1H), 7.20 (d, J = 16.0 Hz, 1H), 7.03−7.00 (m, 2H), 6.76−6.74 (m, 1H), 6.69 (d, J = 8.5 Hz, 1H), 3.81 (s, 3H), 3.51(s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.2, 137.9, 137.6, 130.4, 128.7, 127.7, 126.5, 125.1, 124.3, 117.8, 115.1, 111.9, 55.8. Spectroscopic data for the title compound were consistent with those reported in the literature.[14b]

*(E)-5-methoxy-2-styrylaniline (**1t**).* Light yellow solid (1.868 g, 83%), (hexane/ethyl acetate = 8:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.49 (d, J = 7.5 Hz, 2H), 7.37−7.34 (m, 3H), 7.24 (d, J = 8.0 Hz, 1H), 7.10 (d, J = 16.0 Hz, 1H), 6.90 (d, J = 16.0 Hz, 1H), 6.42−6.40 (m, 1H), 6.27 (d, J = 2.0 Hz, 1H), 3.85 (s, 2H), 3.79 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 160.3, 145.2, 137.9, 128.6, 128.4, 127.2, 126.2, 123.9, 117.0, 105.2, 101.5, 55.2. Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-5-fluoro-2-styrylaniline (**1u**).* White solid (1.939 g, 91%), (hexane/ethyl acetate = 10:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.50 (d, J = 7.5 Hz, 2H), 7.38−7.33 (m, 3H), 7.28 (d, J = 7.0 Hz, 1H), 7.08 (d, J = 16.0 Hz, 1H), 6.93 (d, J = 16.0 Hz, 1H), 6.54−6.50 (m, 1H), 6.45−6.43 (m, 1H), 4.10 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ163.2 (d, J_{C-F} = 243.8 Hz), 145.2 (d, J_{C-F} = 11.3 Hz), 137.5, 130.3, 128.8, 128.7, 127.6, 126.4, 123.3, 120.1 (d, J_{C-F} = 2.5 Hz), 106.1 (d, J_{C-F} = 22.5 Hz), 102.8 (d, J_{C-F} = 25.0 Hz). Spectroscopic data for the title compound were consistent with those reported in the literature.[14c]

*(E)-5-chloro-2-styrylaniline (**1v**).* White solid (1.992 g, 87%), (hexane/ethyl acetate = 12:1), mp 100−101 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.50 (d, J = 7.6 Hz, 2H), 7.39−7.35 (m, 2H), 7.33−7.27 (m, 2H), 7.07 (d, J = 16.0 Hz, 1H), 6.96 (d, J = 16.4 Hz, 1H), 6.80−6.77 (m, 1H), 6.72 (d, J = 2.0 Hz, 1H), 3.75 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 144.9, 137.3, 133.9, 130.8, 128.7, 128.3, 127.8, 126.4, 123.2, 122.3, 119.1, 115.8. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{14}H_{13}ClN$ 230.0731; Found 230.0731.

*(E)-5-nitro-2-styrylaniline (**1w**).* Red solid (2.016 g, 84%), (hexane/ethyl acetate = 8:1), mp 123−124 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, J = 8.5 Hz, 1H), 7.55−7.53 (m, 3H), 7.49 (d, J = 8.5 Hz, 1H), 7.41−7.38 (m, 2H), 7.34−7.31 (m, 1H), 7.11 (s, 2H), 4.10 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 147.8, 144.5, 136.6, 133.9, 129.8, 128.9, 128.6, 127.5, 126.8, 122.1, 113.8, 110.4. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{14}H_{13}N_2O_2$ 241.0972; Found 241.0980.

*Methyl(E)-3-amino-4-styrylbenzoate (**1x**).* Yellow solid (2.278 g, 90%), (hexane/ethyl acetate = 10:1), mp 115−116 °C. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.52 (d, J = 7.5 Hz, 2H), 7.49−7.45 (m, 2H), 7.41 (s, 1H), 7.39−7.36 (m, 2H), 7.31−7.28 (m, 1H), 7.16 (d, J = 16.0 Hz, 1H), 7.08 (d, J = 16.0 Hz, 1H), 4.04 (s, 2H), 3.90 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 167.0, 143.6, 137.1, 132.3, 129.9, 128.8, 128.3, 128.1, 127.0, 126.7, 123.2, 120.4, 117.3, 52.0. HRMS (ESI-TOF) m/z: [M + H]$^+$ Calcd for $C_{16}H_{16}NO_2$ 254.1176; Found 254.1185.

*(E)-2-styryl-5-(trifluoromethyl)aniline (**1y**).* Light yellow solid (2.262 g, 86%), (hexane/ethyl acetate = 8:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (d, J = 7.5 Hz, 2H), 7.48 (d, J = 8.0 Hz, 1H), 7.41−7.37 (m, 2H), 7.32−7.30 (m, 1H), 7.13 (d, J = 16.0 Hz, 1H), 7.07−7.04 (m, 2H), 6.95 (s, 1H), 4.03 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ144.0, 137.0, 132.5, 130.4 (d, J_{C-F} = 31.3 Hz), 128.8, 128.1, 127.6, 127.0, 126.6, 124.2 (d, J_{C-F} = 270.0 Hz), 122.9, 115.6 (q, J_{C-F} = 3.8 Hz), 112.6 (q, J_{C-F} = 3.8 Hz). Spectroscopic data for the title compound were consistent with those reported in the literature.[14a]

*(E)-3-styrylpyridin-2-amine (**1z**).* Yellow solid (1.784 g, 90%), (hexane/ethyl acetate = 10:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.02 (d, J = 4.8 Hz, 1H), 7.61 (d, J = 7.2 Hz, 1H), 7.48 (d, J = 7.6 Hz, 2H), 7.38−7.34 (m, 2H), 7.29 (d, J = 7.2 Hz, 1H), 6.99 (s, 2H), 6.73−6.69 (m, 1H), 4.70 (s, 2H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 156.0, 147.0, 136.9, 134.7, 131.6, 128.7, 127.9, 126.4, 122.9, 118.3, 114.7. Spectroscopic data for the title compound were consistent with those reported in the literature.[2d]

*(E)-4-methyl-N-(2-styrylphenyl)benzenesulfonamide (**1za**).* White solid (3.107 g, 89%), (hexane/ethyl acetate = 10:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 (d, J = 8.0 Hz, 2H), 7.56−7.54 (m, 1H), 7.44−7.42 (m, 1H), 7.39−7.36 (m, 4H), 7.32−7.27 (m, 2H), 7.20 (d, J = 8.0 Hz, 2H), 6.93−6.78 (m, 3H), 2.34 (s, 3H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 143.9, 136.7, 136.5, 133.2, 132.1, 129.6, 128.6, 128.4, 128.1, 127.1, 127.0, 126.8, 126.6, 126.5, 122.7, 21.4. Spectroscopic data for the title compound were consistent with those reported in the literature.[14e]

*(E)-2-styrylphenol (**1zb**).* White solid (1.627 g, 83%), (hexane/ethyl acetate = 3:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 8.0 Hz, 3H), 7.44−7.38 (m, 3H), 7.32−7.28 (m, 1H), 7.21−7.15 (m, 2H), 7.02−6.98 (m, 1H), 6.84 (d, J = 8.0 Hz, 1H), 5.15 (s, 1H); ^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) δ 153.0, 137.6, 130.1, 128.6, 127.6, 127.2, 126.5, 124.7, 123.0, 121.1, 115.9. Spectroscopic data for

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J. Org. Chem. XXXX, XXX, XXX−XXX

the title compound were consistent with those reported in the literature.[14f]

*2-Phenyl-3-(phenylselanyl)-1H-indole (**3a**).* Orange oil (60.7 mg, 87%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.50 (s, 1H), 7.78−7.76 (m, 3H), 7.50−7.43 (m, 4H), 7.37−7.34 (m, 1H), 7.31−7.27 (m, 3H), 7.21−7.15 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.0, 136.1, 134.0, 132.0, 131.9, 129.0, 128.5, 128.5, 128.3, 125.4, 123.2, 121.0, 120.8, 111.0, 95.8. Spectroscopic data for the title compound were consistent with those reported in the literature.[6c]

*3-(Phenylselanyl)-2-(o-tolyl)-1H-indole (**3b**).* Yellow oil (50.1 mg, 69%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.32 (s, 1H), 7.67 (d, J = 8.0 Hz, 1H), 7.44 (d, J = 8.0 Hz, 1H), 7.39−7.35 (m, 1H), 7.33−7.29 (m, 3H), 7.24−7.19 (m, 4H), 7.14−7.09 (m, 3H), 2.27 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.8, 137.5, 136.0, 133.6, 131.9, 131.1, 130.9, 130.2, 129.1, 128.8, 128.7, 125.4, 125.3, 122.9, 120.9, 120.6, 110.9, 97.7, 20.2. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0416.

*3-(Phenylselanyl)-2-(m-tolyl)-1H-indole (**3c**).* Yellow oil (64.6 mg, 89%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.60 (s, 1H), 7.77 (d, J = 8.0 Hz, 1H), 7.62 (d, J = 11.6 Hz, 2H), 7.51 (d, J = 8.0 Hz, 1H), 7.43−7.34 (m, 2H), 7.33−7.28 (m, 4H), 7.24−7.18 (m, 3H), 2.47 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.2, 138.2, 136.1, 134.1, 132.1, 131.9, 129.3, 129.1, 129.0, 128.5, 128.4, 125.7, 125.4, 123.1, 121.0, 120.8, 110.9, 95.8, 21.4. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0410.

*3-(Phenylselanyl)-2-(p-tolyl)-1H-indole (**3d**).* Brown oil (65.4 mg, 90%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.57 (s, 1H), 7.74 (d, J = 7.6 Hz, 1H), 7.69 (d, J = 8.4 Hz, 2H), 7.49 (d, J = 8.0 Hz, 1H), 7.36−7.28 (m, 6H), 7.24−7.17 (m, 3H), 2.46 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.3, 138.6, 136.1, 134.1, 132.1, 129.3, 129.1, 129.0, 128.3, 128.3, 125.3, 123.1, 121.0, 120.8, 110.9, 95.4, 21.3. Spectroscopic data for the title compound were consistent with those reported in the literature.[14d]

*2-(4-(tert-Butyl)phenyl)-3-(phenylselanyl)-1H-indole (**3e**).* Orange oil (74.6 mg, 92%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.53 (s, 1H), 7.71−7.69 (m, 3H), 7.50−7.45 (m, 3H), 7.32−7.28 (m, 1H), 7.25−7.19 (m, 3H), 7.18−7.12 (m, 3H), 1.38 (s, 9H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 151.7, 142.1, 136.1, 134.2, 132.2, 129.1, 129.0, 128.2, 128.1, 125.6, 125.3, 123.1, 121.0, 120.8, 110.9, 95.3, 34.7, 31.2. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{24}H_{23}NSeNa$ 406.1070; Found 406.1060.

*2-(4-Methoxyphenyl)-3-(phenylselanyl)-1H-indole (**3f**).* Brown oil (71.2 mg, 94%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.58 (s, 1H), 7.75−7.72 (m, 3H), 7.49 (d, J = 8.0 Hz, 1H), 7.36−7.28 (m, 4H), 7.24−7.17 (m, 3H), 7.03 (d, J = 8.8 Hz, 2H), 3.90 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 159.9, 142.2, 136.0, 134.2, 132.2, 129.8, 129.0, 128.2, 125.4, 124.5, 122.9, 121.0, 120.6, 114.1, 110.8, 95.0, 55.3. Spectroscopic data for the title compound were consistent with those reported in the literature.[8f]

*2-(2-Chlorophenyl)-3-(phenylselanyl)-1H-indole (**3g**).* Orange oil (60.5 mg, 79%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.68 (s, 1H), 7.66 (d, J = 8.0 Hz, 1H), 7.51−7.46 (m, 3H), 7.38−7.35 (m, 1H), 7.33−7.29 (m, 2H), 7.21−7.18 (m, 3H), 7.13−7.09 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 139.8, 136.0, 133.6, 133.3, 130.9, 130.7, 130.2, 129.9, 128.9, 128.6, 126.5, 125.4, 123.4, 121.0, 120.9, 111.1, 98.5. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}ClNSeNa$ 405.9878; Found 405.9862.

*2-(3-Chlorophenyl)-3-(phenylselanyl)-1H-indole (**3h**).* Orange oil (62.8 mg, 82%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.54 (s, 1H), 7.71−7.69 (m, 2H), 7.65−7.62 (m, 1H), 7.45 (d, J = 8.4 Hz, 1H), 7.36−7.35 (m, 2H), 7.33−7.29 (m, 1H), 7.23−7.20 (m, 3H), 7.17−7.11 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 140.2, 136.2, 134.5, 133.7, 133.6, 132.0, 129.8, 129.1, 128.6, 128.5, 128.3, 126.7, 125.7, 123.7, 121.3, 121.1, 111.1, 97.1. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}ClNSeNa$ 405.9878; Found 405.9869.

*2-(4-Chlorophenyl)-3-(phenylselanyl)-1H-indole (**3i**).* Orange oil (64.3 mg, 84%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.53 (s, 1H), 7.70−7.65 (m, 3H), 7.46−7.39 (m, 3H), 7.32−7.28 (m, 1H), 7.23−7.22 (m, 3H), 7.17−7.11 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 140.7, 136.2, 134.6, 133.7, 132.0, 130.4, 129.7, 129.1, 128.8, 128.3, 125.6, 123.5, 121.3, 121.0, 111.0, 96.5. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}ClNSeNa$ 405.9878; Found 405.9882.

*2-(4-Fluorophenyl)-3-(phenylselanyl)-1H-indole (**3j**).* Orange oil (63.9 mg, 87%), (hexane/ethyl acetate = 14:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.52 (s, 1H), 7.70−7.67 (m, 3H), 7.45 (d, J = 8.0 Hz, 1H), 7.32−7.28 (m, 1H), 7.23−7.19 (m, 3H), 7.17−7.11 (m, 5H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 162.9 (d, J_{C-F} = 247.5 Hz), 141.1, 136.1, 133.9, 132.0, 130.3 (d, J_{C-F} = 8.8 Hz), 129.1, 128.3, 128.1 (d, J_{C-F} = 3.8 Hz), 125.5, 123.4, 121.1 (d, J_{C-F} = 41.3 Hz), 115.7 (d, J_{C-F} = 21.3 Hz), 111.0, 96.1. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}FNSeNa$ 390.0168; Found 390.0165.

*2-(3-Fluorophenyl)-3-(phenylselanyl)-1H-indole (**3k**).* Orange oil (62.4 mg, 85%), (hexane/ethyl acetate = 14:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.57 (s, 1H), 7.69 (d, J = 8.0 Hz, 1H), 7.52 (d, J = 8.0 Hz, 1H), 7.50−7.45 (m, 2H), 7.43−7.38 (m, 1H), 7.33−7.29 (m, 1H), 7.23−7.19 (m, 3H), 7.17−7.06 (m, 4H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 162.7(d, J_{C-F} = 245.0 Hz), 140.4, 136.2, 134.0 (d, J_{C-F} = 8.8 Hz), 133.6, 132.0, 130.2 (d, J_{C-F} = 8.8 Hz), 129.1, 128.5, 125.6, 124.1 (d, J_{C-F} = 2.5 Hz), 123.7, 121.2 (d, J_{C-F} = 26.3 Hz), 115.5, 115.3, 111.1, 96.9. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}FNSeNa$ 390.0168; Found 390.0160.

*3-(Phenylselanyl)-2-(4-(trifluoromethyl)phenyl)-1H-indole (**3l**).* Yellow oil (54.2 mg, 65%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.66 (s, 1H), 7.86 (d, J = 8.0 Hz, 2H), 7.69 (d, J = 7.6 Hz, 3H), 7.48 (d, J = 8.4 Hz, 1H), 7.34−7.30 (m, 1H), 7.23−7.20 (m, 3H), 7.16−7.10 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 140.1, 136.4, 135.5, 133.6, 132.0, 130.3 (d, J_{C-F} = 32.5 Hz), 129.2, 128.7, 128.4, 125.7, 125.6 (q, J_{C-F} = 3.8 Hz), 124.0 (d, J_{C-F} = 270.0 Hz), 123.9, 121.3 (d, J_{C-F} = 31.3 Hz), 111.2, 97.6. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{14}F_3NSeNa$ 440.0142; Found 440.0134.

*2-(4-Nitrophenyl)-3-(phenylselanyl)-1H-indole (**3m**).* Orange oil (47.3 mg, 60%), (hexane/ethyl acetate = 12:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.92 (s, 1H), 8.25 (d, J = 8.5 Hz, 2H), 7.94 (d, J = 8.5 Hz, 2H), 7.71 (d, J = 8.0 Hz, 1H), 7.50 (d, J = 8.5 Hz, 1H), 7.35−7.32 (m, 1H), 7.23−7.19 (m, 3H), 7.16−7.11 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 147.2, 138.8, 138.2, 136.7, 133.2, 132.1, 129.2, 129.0, 128.5, 125.9, 124.5, 123.8, 121.7, 121.4, 111.3, 99.0. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{20}H_{14}N_2O_2SeNa$ 417.0118; Found 417.0122.

*2-(Naphthalen-2-yl)-3-(phenylselanyl)-1H-indole (**3n**).* Orange oil (71.0 mg, 89%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.59 (s, 1H), 8.15 (s, 1H), 7.88−7.82 (m, 4H), 7.76 (d, J = 8.0 Hz, 1H), 7.54−7.51 (m, 2H), 7.46 (d, J = 8.0 Hz, 1H), 7.35−7.29 (m, 3H), 7.24 (d, J = 7.2 Hz, 1H), 7.19−7.13 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 141.9, 136.3, 134.1, 133.1, 133.1, 132.2, 129.4, 129.0, 128.5, 128.3, 128.2, 127.8, 127.7, 126.6, 126.5, 126.0, 125.5, 123.3, 121.1, 120.9, 111.0, 96.5. HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $C_{24}H_{18}NSe$ $[M + H]^+$: 400.0599; Found 400.0612.

*4-Methyl-2-phenyl-3-(phenylselanyl)-1H-indole (**3p**).* Orange oil (54.4 mg, 75%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.34 (s, 1H), 7.68 (d, J = 7.6 Hz, 2H), 7.47−7.39 (m, 3H), 7.37−7.30 (m, 2H), 7.25−7.22 (m, 2H), 7.20−7.10 (m, 2H), 6.94 (d, J = 7.2 Hz, 1H), 6.86 (s, 1H), 2.61 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 137.2, 136.5, 132.5, 130.2, 129.2, 129.1, 129.0, 129.0, 128.6, 128.4, 127.6, 125.1, 122.5, 120.4, 108.5, 98.6, 18.7. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0416.

*5-Methyl-2-phenyl-3-(phenylselanyl)-1H-indole (**3q**).* Orange oil (61.7 mg, 85%), (hexane/ethyl acetate = 16:1). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.52 (s, 1H), 7.76 (d, J = 6.8 Hz, 2H), 7.54 (s, 1H), 7.49−7.41 (m, 3H), 7.38 (d, J = 8.4 Hz, 1H), 7.29 (d, J = 6.0 Hz, 2H), 7.22−7.16 (m, 4H), 2.50 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$)

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J. Org. Chem. XXXX, XXX, XXX−XXX

δ 142.2, 134.4, 134.3, 132.4, 132.1, 130.5, 129.1, 129.0, 128.5, 128.4, 128.1, 125.3, 124.9, 120.4, 110.7, 95.1, 21.4. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0413.

*6-Methyl-2-phenyl-3-(phenylselanyl)-1H-indole (**3r**).* Orange oil (61.0 mg, 84%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.45 (s, 1H), 7.73 (d, *J* = 6.8 Hz, 2H), 7.55 (d, *J* = 8.4 Hz, 1H), 7.46−7.36 (m, 3H), 7.25−7.22 (m, 3H), 7.16−7.08 (m, 3H), 7.03 (d, *J* = 8.0 Hz, 1H), 2.51 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 141.4, 136.6, 134.1, 133.3, 132.2, 130.0, 129.0, 128.6, 128.4, 128.4, 128.3, 125.3, 122.9, 120.5, 110.9, 95.7, 21.7. Spectroscopic data for the title compound were consistent with those reported in the literature.[8e]

*5-Methoxy-2-phenyl-3-(phenylselanyl)-1H-indole (**3s**).* Yellow oil (60.7 mg, 80%), (hexane/ethyl acetate = 12:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.50 (s, 1H), 7.71 (d, *J* = 7.6 Hz, 2H), 7.45−7.37 (m, 3H), 7.35 (d, *J* = 8.8 Hz, 1H), 7.22 (d, *J* = 7.6 Hz, 2H), 7.17−7.10 (m, 4H), 6.94−6.91 (m, 1H), 3.81 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 155.3, 142.6, 134.1, 133.0, 132.1, 131.1, 129.0, 128.6. 128.5, 128.4, 128.3, 125.4, 113.7, 111.8, 102.2, 95.6, 55.8. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NOSeNa$ 402.0373; Found 402.0365.

*6-Methoxy-2-phenyl-3-(phenylselanyl)-1H-indole (**3t**).* Yellow oil (60.6 mg, 80%), (hexane/ethyl acetate = 12:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.47 (s, 1H), 7.73−7.70 (m, 2H), 7.51 (d, *J* = 8.8 Hz, 1H), 7.45−7.41 (m, 2H), 7.38−7.34 (m, 1H), 7.22−7.20 (m, 2H), 7.16−7.09 (m, 3H), 6.95 (d, *J* = 2.0 Hz, 1H), 6.85−6.82 (m, 1H), 3.87 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 155.6, 140.8, 136.7, 133.5, 132.6, 131.0, 129.1, 129.0, 128.8, 128.6, 128.4, 128.2, 126.8, 126.4, 125.6, 93.5, 56.4. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NOSeNa$ 402.0368; Found 402.0361.

*6-Fluoro-2-phenyl-3-(phenylselanyl)-1H-indole (**3u**).* Yellow oil (64.5 mg, 88%), (hexane/ethyl acetate = 14:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.57 (s, 1H), 7.72 (d, *J* = 7.2 Hz, 2H), 7.58−7.54 (m, 1H), 7.46−7.37 (m, 3H), 7.20 (d, *J* = 7.2 Hz, 2H), 7.16−7.11 (m, 4H), 6.96−6.91 (m, 1H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 160.6 (d, J_{C-F} = 237.5 Hz), 142.4 (d, J_{C-F} = 3.8 Hz), 136.0 (d, J_{C-F} = 12.5 Hz), 133.7, 131.8, 129.1, 128.7, 128.5, 128.4, 128.3, 125.6, 121.8 (d, J_{C-F} = 10.0 Hz), 109.8 (d, J_{C-F} = 23.8 Hz), 97.4 (d, J_{C-F} = 26.3 Hz), 96.0. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{20}H_{14}FNSeNa$ 390.0168; Found 390.0156.

*6-Chloro-2-phenyl-3-(phenylselanyl)-1H-indole (**3v**).* Yellow oil (68.2 mg, 89%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.60 (s, 1H), 7.72 (d, *J* = 6.8 Hz, 2H), 7.56 (d, *J* = 8.4 Hz, 1H), 7.47−7.44 (m, 4H), 7.20−7.18 (m, 2H), 7.17−7.11 (m, 4H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.6, 136.4, 133.6, 131.6, 130.7, 129.1, 129.0, 128.8, 128.7, 128.4, 128.4, 125.6, 121.8, 121.8, 111.0, 96.1. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{20}H_{14}ClNSeNa$ 405.9878; Found 405.9882.

*6-Nitro-2-phenyl-3-(phenylselanyl)-1H-indole (**3w**).* Yellow oil (72.5 mg, 92%), (hexane/ethyl acetate = 12:1). ^1H NMR (500 MHz, $CDCl_3$) δ 9.22 (s, 1H), 8.44 (s, 1H), 8.07−8.05 (m, 1H), 7.78 (d, *J* = 6.4 Hz, 2H), 7.69 (d, *J* = 8.8 Hz, 1H), 7.50−7.46 (m, 3H), 7.16−7.12 (m, 5H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 147.4, 144.1, 137.1, 134.6, 132.9, 130.9, 129.7, 129.3, 128.9, 128.6, 128.6, 126.0, 120.9, 116.6, 108.0, 97.3. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{20}H_{14}N_2O_2SeNa$ 417.0118; Found 417.0122.

*Methyl 2-phenyl-3-(phenylselanyl)-1H-indole-6-carboxylate (**3x**).* Light yellow solid (73.2 mg, 90%), (hexane/ethyl acetate = 14:1), mp 206−207 °C. ^1H NMR (500 MHz, DMSO) δ 12.46 (s, 1H), 8.14 (s, 1H), 7.84 (d, *J* = 7.5 Hz, 2H), 7.72 (d, *J* = 8.5 Hz, 1H), 7.54−7.50 (m, 3H), 7.47−7.44 (m, 1H), 7.18−7.15 (m, 2H), 7.12−7.09 (m, 3H), 3.87 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, DMSO) δ 166.9, 145.6, 135.8, 135.1, 133.3, 131.2, 129.3, 129.0, 128.7, 128.5, 127.7, 125.7, 123.6, 121.1, 119.5, 113.6, 94.0, 51.9. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{22}H_{17}NO_2SeNa$ 430.0323; Found 430.0317.

*2-Phenyl-3-(phenylselanyl)-6-(trifluoromethyl)-1H-indole (**3y**).* Orange oil (76.7 mg, 92%), (hexane/ethyl acetate = 12:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.77 (s, 1H), 7.76−7.73 (m, 4H), 7.50−7.42 (m, 4H), 7.22−7.13 (m, 5H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 144.6, 135.1, 134.5, 133.4, 131.3, 129.2, 129.2, 128.8, 128.6, 128.5, 125.8, 125.3 (d, J_{C-F} = 31.3 Hz), 125.0 (d, J_{C-F} = 270 Hz), 121.3, 117.8 (q, J_{C-F} = 3.8 Hz), 108.6 (q, J_{C-F} = 3.8 Hz), 96.4. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{14}F_3NSeNa$ 440.0142; Found 440.0134.

*2-Phenyl-3-(o-tolylselanyl)-1H-indole (**3zc**).* Yellow oil (47.9 mg, 66%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.59 (s, 1H), 7.72 (d, *J* = 7.5 Hz, 2H), 7.64 (d, *J* = 8.0 Hz, 1H), 7.48−7.42 (m, 3H), 7.40−7.37 (m, 1H), 7.31−7.28 (m, 1H), 7.20−7.17 (m, 1H), 7.15 (d, *J* = 7.0 Hz, 1H), 7.05−7.02 (m, 1H), 6.86 (d, *J* = 3.5 Hz, 2H), 2.47 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.3, 136.3, 136.1, 134.5, 132.2, 132.0, 129.8, 128.6, 128.6, 128.4, 127.6, 126.5, 125.2, 123.3, 121.1, 121.0, 111.0, 95.2, 21.2. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0416.

*2-Phenyl-3-(m-tolylselanyl)-1H-indole (**3zd**).* Yellow oil (58.8 mg, 81%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.61 (s, 1H), 7.75 (d, *J* = 7.5 Hz, 2H), 7.69 (d, *J* = 8.0 Hz, 1H), 7.46−7.43 (m, 3H), 7.41−7.38 (m, 1H), 7.30−7.27 (m, 1H), 7.21−7.18 (m, 1H), 7.11 (s, 1H), 7.04−6.97 (m, 2H), 6.92 (d, *J* = 7.0 Hz, 1H), 2.23 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.0, 138.7, 136.2, 133.8, 132.2, 132.1, 128.9, 128.9, 128.6, 128.5, 128.5, 126.4, 125.4, 123.2, 121.0, 121.0, 110.9, 96.0, 21.3. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0419.

*2-Phenyl-3-(p-tolylselanyl)-1H-indole (**3ze**).* Yellow oil (61.7 mg, 85%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.55 (s, 1H), 7.74 (d, *J* = 7.6 Hz, 2H), 7.67 (d, *J* = 8.0 Hz, 1H), 7.46−7.43 (m, 3H), 7.41−7.37 (m, 1H), 7.29 (d, *J* = 7.2 Hz, 1H), 7.20−7.16 (m, 1H), 7.12 (d, *J* = 8.0 Hz, 2H), 6.96 (d, *J* = 8.0 Hz, 2H), 2.24 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 141.9, 136.2, 135.2, 132.1, 132.1, 130.1, 129.8, 128.6, 128.6, 128.5, 128.5, 123.2, 121.1, 121.0, 110.9, 96.3, 20.9. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{21}H_{17}NSeNa$ 386.0419; Found 386.0431.

*3-((4-Nitrophenyl)selanyl)-2-phenyl-1H-indole (**3zg**).* Orange oil (72.5 mg, 92%), (hexane/ethyl acetate = 12:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.75 (s, 1H), 8.16 (d, *J* = 8.5 Hz, 1H), 7.95 (d, *J* = 8.5 Hz, 2H), 7.67 (d, *J* = 7.0 Hz, 2H), 7.62−7.56 (m, 1H), 7.51 (d, *J* = 8.5 Hz, 1H), 7.47−7.40 (m, 3H), 7.34−7.31 (m, 1H), 7.28 (d, *J* = 8.5 Hz, 1H), 7.23−7.20 (m, 1H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 145.8, 145.3, 142.8, 136.2, 133.2, 131.5, 131.4, 129.0, 128.8, 128.4, 127.8, 124.5, 123.9, 123.7, 121.6, 120.4, 111.3, 94.1. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{20}H_{14}N_2O_2SeNa$ 417.0118; Found 417.0122.

*3-((4-Fluorophenyl)selanyl)-2-phenyl-1H-indole (**3zh**).* Yellow oil (64.6 mg, 88%), (hexane/ethyl acetate = 14:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.57 (s, 1H), 7.72 (d, *J* = 7.0 Hz, 2H), 7.65 (d, *J* = 8.0 Hz, 1H), 7.47−7.45 (m, 3H), 7.42−7.39 (m, 1H), 7.30−7.27 (m, 1H), 7.21−7.16 (m, 3H), 6.86−6.83 (m, 2H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 161.5 (d, J_{C-F} = 242.5 Hz), 142.0, 136.1, 131.9 (d, J_{C-F} = 11.3 Hz), 130.3 (d, J_{C-F} = 7.5 Hz), 128.7, 128.6, 128.5, 128.2 (d, J_{C-F} = 3.8 Hz), 123.4, 121.2, 120.8, 116.1 (d, J_{C-F} = 21.3 Hz), 111.0, 96.4. HRMS (ESI-TOF) *m/z*: $[M + Na]^+$ Calcd for $C_{20}H_{14}FNSeNa$ 390.0168; Found 390.0168.

*3-(Naphthalen-1-ylselanyl)-2-phenyl-1H-indole (**3zi**).* Yellow oil (67.0 mg, 84%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.64 (s, 1H), 8.23 (d, *J* = 8.0 Hz, 1H), 7.86−7.84 (m, 1H), 7.76−7.74 (m, 2H), 7.66−7.61 (m, 2H), 7.59−7.51 (m, 2H), 7.48 (d, *J* = 8.0 Hz, 1H), 7.44−7.38 (m, 3H), 7.32−7.28 (m, 1H), 7.19−7.11 (m, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 142.5, 136.3, 134.0, 132.7, 132.3, 132.1, 132.0, 128.7, 128.5, 128.5, 126.1, 126.1, 126.0, 125.9, 125.6, 123.3, 121.2, 121.0, 111.0, 95.0. HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $C_{24}H_{18}NSe$ 400.0599; Found 400.0612.

*2-Phenyl-3-(thiophen-2-ylselanyl)-1H-indole (**3zj**).* Orange oil (61.7 mg, 87%), (hexane/ethyl acetate = 16:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.45 (s, 1H), 7.86−7.80 (m, 3H), 7.53−7.49 (m, 2H), 7.46−7.39 (m, 2H), 7.28 (d, *J* = 1.6 Hz, 1H), 7.25−7.23 (m, 1H), 7.22−7.19 (m, 1H), 7.10−7.09 (m, 1H), 6.87−6.84 (m, 1H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 141.2, 135.9, 132.1, 131.8, 131.7, 128.9, 128.7, 128.6, 127.9, 127.6, 123.2, 121.1, 120.8, 111.0,

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J. Org. Chem. XXXX, XXX, XXX−XXX

98.8. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{18}H_{13}NSSeNa$ 377.9826; Found 377.9841.

*3-(Methylselanyl)-2-phenyl-1H-indole (**3zk**).* Light yellow oil (44.2 mg, 77%), (hexane/ethyl acetate = 18:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.33 (s, 1H), 7.80−7.77 (m, 3H), 7.49−7.46 (m, 2H), 7.41−7.36 (m, 2H), 7.25−7.21 (m, 2H), 2.11 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 140.1, 136.0, 132.5, 131.8, 128.5, 128.5, 128.3, 122.9, 120.6, 111.0, 98.1, 8.9. Spectroscopic data for the title compound were consistent with those reported in the literature.[6d]

*2-(4-Methoxyphenyl)-3-(methylselanyl)-1H-indole (**3zl**).* Light yellow oil (55.8 mg, 88%), (hexane/ethyl acetate = 14:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.33 (s, 1H), 7.81−7.78 (m, 1H), 7.74 (d, J = 8.8 Hz, 2H), 7.39−7.36 (m, 1H), 7.25−7.22 (m, 2H), 7.03 (d, J = 8.8 Hz, 2H), 3.88 (s, 3H), 2.13 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 159.7, 140.2, 135.9, 131.9, 129.7, 125.0, 122.6, 120.5, 120.4, 114.1, 110.8, 97.3, 55.3, 8.8. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{16}H_{15}NOSeNa$ 340.0217; Found 340.0221.

*6-Methyl-3-(methylselanyl)-2-phenyl-1H-indole (**3zm**).* Yellow oil (48.1 mg, 80%), (hexane/ethyl acetate = 18:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.26 (s, 1H), 7.81−7.79 (m, 2H), 7.67 (d, J = 8.0 Hz, 1H), 7.51−7.47 (m, 2H), 7.41−7.38 (m, 1H), 7.20 (s, 1H), 7.07 (d, J = 8.0 Hz, 1H), 2.50 (s, 3H), 2.12 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 139.4, 136.4, 133.0, 132.6, 129.7, 128.5, 128.4, 128.1, 122.4, 120.3, 110.9, 21.7, 8.9. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{16}H_{15}NSeNa$ 324.0268; Found 324.0265.

*3-(Methylselanyl)-2-(4-nitrophenyl)-1H-indole (**3zn**).* Orange oil (48.5 mg, 73%), (hexane/ethyl acetate = 14:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.58 (s, 1H), 8.34 (d, J = 8.5 Hz, 2H), 8.04 (d, J = 9.0 Hz, 2H), 7.82 (d, J = 8.0 Hz, 1H), 7.45 (d, J = 8.0 Hz, 1H), 7.34−7.31 (m, 1H), 7.27 (d, J = 9.0 Hz, 1H), 2.15 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 147.1, 138.7, 137.1, 136.6, 131.8, 128.8, 124.3, 123.9, 121.3, 121.2, 111.3, 101.4, 9.1. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{12}N_2O_2SeNa$ 354.9962; Found 354.9959.

*3-(Methylselanyl)-6-nitro-2-phenyl-1H-indole (**3zo**).* Yellow oil (59.1 mg, 89%), (hexane/ethyl acetate = 14:1). ^1H NMR (500 MHz, $CDCl_3$) δ 8.89 (s, 1H), 8.38 (d, J = 1.5 Hz, 1H), 8.13−8.11 (m, 1H), 7.87−7.82 (m, 3H), 7.56−7.53 (m, 2H), 7.51−7.48 (m, 1H), 2.13 (s, 3H); $^{13}C\{^1H\}$ NMR (125 MHz, $CDCl_3$) δ 145.7, 143.9, 136.9, 134.4, 131.3, 129.5, 128.9, 128.6, 120.7, 116.3, 107.8, 99.3, 9.1. HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $C_{15}H_{12}N_2O_2SeNa$ 354.9962; Found 354.9967.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available free of charge at https://pubs.acs.org/doi/10.1021/acs.joc.0c01918.

^1H and ^{13}C NMR spectra of all products (PDF)

■ AUTHOR INFORMATION

Corresponding Authors

Yinlin Shao − *College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China;* orcid.org/0000-0003-1935-0345; Email: shaoyl@wzu.edu.cn

Renhao Li − *School of Pharmaceutical Sciences, Wenzhou Medical University, Wenzhou 325035, China;* orcid.org/0000-0003-2451-2142; Email: lirh@wmu.edu.cn

Jiuxi Chen − *College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China;* orcid.org/0000-0001-6666-9813; Email: jiuxichen@wzu.edu.cn

Authors

Zhiwei Zhao − *College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China*

Yetong Zhang − *College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China*

Wenzhang Xiong − *College of Chemistry & Materials Engineering, Wenzhou University, Wenzhou 325035, China*

Complete contact information is available at: https://pubs.acs.org/10.1021/acs.joc.0c01918

Notes

The authors declare no competing financial interest.

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J. Org. Chem. XXXX, XXX, XXX−XXX